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$$R=\text{radius}=\frac{AC}{2\sin b}=\frac{1}{4}\sqrt{\frac{(ab+cd)(ac+bd)(ad+bc)}{(s-a)(s-b)(s-c)(s-d)}}$$

$$2R=D=\tfrac{1}{2}\sqrt{\frac{(39)(42)(38)}{(4)(6)(3)(5)}}=\tfrac{1}{2}\sqrt{172.9}=6.57457225.$$

Also solved by *P. S. BERG, H. C. WHITAKER, J. R. BALDWIN, P. H. PHILBRICK, J. W. SCHEFFER.*

[Note.—The formula for the area of an inscriptable quadrilateral is $A=\sqrt{s(s-a)(s-b)(s-b)(s-c)(s-d)}$, where $s=\frac{1}{2}(a+b+c+d)$.—Ed.]

7. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy in the Ohio University, Athens, Ohio.

Through each point of the straight line $x=my+h$ is drawn a chord of the parabola $y^2=4ax$, which is bisected in the point. Prove that this chord touches the parabola $(y+2am)^2=8a(x-h)$.

II. Solution by L. E. PRATT, Tecumseh, Nebraska.

Let $y=Bx+C$....(1) be a straight line cutting the given parabola. The co-ordinates of the middle point of the chord intercepted by the curve are

$$\left(\frac{2a-BC}{B^2},\ \frac{2a}{B}\right).$$

Substituting these for x and y in the equations of the given straight line, we have

$$BC=2a-2amB-hB^2\ \ldots.(2).$$

If (x_1,y_1) be any point of (1) we have $y_1=Bx_1+C$....(3).

Eliminating C from (2) and (3) we obtain a quadratic in B which may be written

$$B=\frac{y_1+2am\pm\sqrt{(y_1+2am)^2-8a(x_1-h)}}{2(x_1-h)}\ \ldots.(4).$$

This result shows that two chords bisected by the straight line $x=my+h$ may be drawn through the point x_1,y_1; that when the roots of B, the angular coefficient, are equal the two chords coincide in one; that this takes place when the radical in (4) is equal to zero. But when the radical equals zero the point x_1,y_1, is a point of the parabola

$$(y+2am)^2=8a(x-h)$$

and the straight line (1) is tangent to it.

This problem was solved in a very excellent manner by *Professors HUME, SCHEFFER,* and *ZERR.*

9. Proposed by J. C. GREGG, Superintendent of Schools, Brazil, Indiana.

Two circles intersect in A and B. Through A two lines CAE and DAF are drawn, each passing through a centre and terminated by the circumference. Show that $CA\times AE=DA\times AF$. [*Euclid.*]

Solution by Miss GRACE H. GRIDLEY, Student in Kidder Institute, Kidder, Missouri.

Let the straight lines CAE and DAF pass through the point of intersection A of the two circles, and through the centers O and O', respectively.